Faculty of Manufacturing Engineering

"THE STUDY OF LEAN PRINCIPLES TO SUPPORT THE ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)"

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THE STUDY OF LEAN PRINCIPLES TO SUPPORT THE ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

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DECLARATION

I hereby declare that this report **THE STUDY OF LEAN PRINCIPLES TO SUPPORT THE ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)** is the result of my own research except as cited in the references.

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Master of Manufacturing Engineering (Industrial Engineering) with Honours. The members of the supervisory committee is as follow

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ABSTRACT

Lean and Environmental Management System (EMS) are widely used in the organization to enhance their performance and efficiency. ISO 14001 requires a commitment to continual improvement and lean principles will support EMS to achieve the continual improvement. The purpose of this study is to examine the characteristic of the lean principles into EMS and to propose linkage of the lean principles and EMS. To achieve the objective of the study, literature survey and quantitative research method using questionnaires survey are used. The findings of this study confirm that ISO 14001 certified company practice lean production practices. The study also proves that lean principles have positive and significant relationship with ISO 14001 EMS and the linkage can be made between lean principles and ISO 14001 to achieve Continual Improvement. The study is not limit on lean tools and technique but focus on the five lean principles with ISO 14001.

DEDICATIONS

This thesis is dedicated to my parents,

Razali Ibrahim & Rosni Mohamad

who taught me that even the largest task can be accomplished if it is done one step at a time

&

for their endless love, support, and encouregement...

To my younger brother and sister,

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for all of your love, support, and sacrifice throughout my life...

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CHAPTER 1

INTRODUCTION

1.1 Background of study

Lean is a set of principles and techniques that focuses on identifying and eliminating non value added activity within a process. Lean as an improvement initiative, attempts to involve everyone in a quest to eliminate any and all form of waste. According to Appiotti and Bertels (2010), lean is considered a philosophy applicable for all sectors. Across an organization, lean practices can be used in engineering, in the front office, in R & D and even in environmental management system to improve operations by driving waste from existing environments.

An environmental management system (EMS) is a management framework for reducing environmental impacts and improving organizational performance over time. EMS provides organizations of all types with a structured approach for managing environmental and regulatory responsibilities to improve overall environmental performance, including areas not subject to regulation such as unregulated risk, resource conservation and energy efficiency. The interaction between the organization and the environment becomes the focus of the environmental work other than the fluid interface existing between them (Sheldon & Yoxon, 2002).

ISO 14001 is the world's most recognized EMS framework that helps organizations both to manage better the impact of their activities on the environment and demonstrate sound

environmental management. ISO 14001 is designed to be flexible enough to be applied to any size of organization in both the private and public sectors.

Lean is one of key business process strategies and quality control process employed by companies to enhance their manufacturing process and quality performance. However, there is some information available relating to the integration of these approaches to provide a single and highly effective strategy for change in companies.

In the current practice, there are some integration has been done between lean and EMS but all the integrations are using the lean tools. According to Pojasek (2008), the management system standards have the requirement corrective action and the best foundation for corrective action is root cause analysis, which seeks to understand the ultimate source of the problem to be addressed. Lean is well suited to root cause analysis because it was design to identify all types of waste.

Management system standards place emphasis on preventive action. Taking such action is appropriate for operations where nothing has been outside of conformance with the management system. Once again, lean is well suited to the task. Lean can be used to analyze what could go wrong with an operation and then work to prevent those problems from happening. There is a lean tool known as mistake proofing or poka-yoke. It is perfectly suited for preventive action program (Pojasek, 2008).

1.2 Problem Statement

Continual improvement is a key element of ISO 14001. It is at the heart of the Plan-Do-Check-Act (PDCA) cycle that is the engine of the environmental management system. Together with compliance and pollution prevention, it is a basic commitment the organization has to endorse in its environmental policy.

There are two major aspects of continual improvement in ISO 14001. One is how to identify and quantify or how to measure the improvement of environmental performance and the other is how to embed continual improvement in the structure of the environmental management system.

Organizations use a variety of management systems for functional areas such as quality and environment. The systems help companies "mainstream" their management of these areas and ensure that they are aligned with the business's overall objectives and goals. Companies that adopt widely used management system standard ISO 14001 must commit to achieving compliance with legal requirements and using prevention based approach to management. More importantly, they must commit to continual improvement. This management system standard does not prescribe specific methods for generating improvement. That's where lean comes in. Lean can serve practical method for achieving continual improvement.

According to Sullivan and Wyndham, (2001), EMS is designed to integrate with other management systems within a company. Quality management and control, occupational health and safety, total quality management or other systems can all be integrated with an

EMS to add the extra dimension of environmental issues to existing procedures and processes.

Based on current situation, there is no integration of lean principles into EMS. The integration of lean principles into EMS will serve practical methods for EMS to achieve the continual improvement.

1.3 Objective of Study

The main objective of the study is the lean principles supported on Environmental Management System (EMS).

The specific objectives of this study are:

a) To clarify the characteristic of lean principle adoption into EMS.
b) To identify linkage of the lean principle and EMS.

1.4 Hypothesis

The data generated from the study will enable the testing of a number of research hypothesis. In this study, the purpose of the study will concentrate on:

H1: The claim that the ISO 14001 certified companies has practice the lean production practices.

H2: Lean Principles has positive and significant relationship with ISO 14001 requirement.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Literature review was a majority of the research. This chapter will sought for theoretical support by an ongoing literature review on existing knowledge of both lean and Environmental Management System (EMS) that has been done by researchers, experts and authors. Since the research explored the adoption of lean principles in EMS, a deep knowledge in both areas was essential to carry out the work.

Generally, the purpose of a literature review is to analyze critically segment of a published body of knowledge through summary, classification and comparison of prior research studies, reviews of literature, and theoretical articles. Three online databases, namely Science Direct, Emerald, and Scopus, provided most of the journals needed for the research. The keywords like "Lean", "ISO 14001", "Environment Management System", "EMS", etc. are used. Textbooks were also used for reference and further reading. The study on adopting the Lean principle in EMS is new so there are not much existing knowledge concerned it.

The literature review has been divided into three areas:

a) Environmental Management System (EMS)

    i. Introduction and definitions.

ii. ISO standards and principles.

iii. Need for ISO 14001 and its benefits.

iv. ISO 14001 sustainability issues.

b) Lean

i. Introduction and definitions.

ii. Lean system

iii. Lean principles

iv. Integrating Lean into ISO 14001

c) Integrations

i. Introduction and definition.

ii. Integration of Lean with other system.

2.2 Environmental Management System (EMS)

In the 21st century, there is great emphasis on companies and businesses to contribute towards protecting the environment as part of their corporate social responsibilities. Companies need to adopt measures to protect and enhance the environment in order to maintain good relations with customers, suppliers and vendors. There is a growing need for

businesses to fulfil their corporate social responsibilities in order to survive in the global economy. Environment Management System or EMS can help the company in fulfilling their responsibilities towards protecting the world environment (Gbedemah, 2004).

An EMS provides the framework to manage the company's environmental responsibilities effectively and also helps in integrating the environmental initiatives into the day-to-day operations. An efficient EMS is critical to all types of business irrespective of the nature, size and scale of operations. In the global market, it is important for manufacturing, automobile, retail and service industries to have an EMS in place. An effective EMS contributes to cost savings and reduces the environmental liabilities (Cheremisinoff, Rosenfeld, & Rosenfeld, 2010). A company that has a good EMS in place will be able to satisfy the needs of suppliers, customers, employees, investors, regulatory bodies and environmental groups. This will help in boosting the image and reputation of the company in the marketplace.

An EMS is defined as part of the management system in which the objectives, plans, policies and procedures relating to its environmental responsibilities are defined. It provides a basis for identifying, evaluating, managing and sustaining the company's contribution towards the environment. EMS ensures that the measures taken towards environmental protection are implemented in the organisation and that the company meets its environmental goals. It also helps in ensuring that employees, suppliers and vendors understand their role in the environmental policy and contribute effectively towards meeting the environmental objectives of the organisation (Visser, Matten, Pohl, & Tolhurst, 2010).

2.2.1 ISO 14001 standards and principles

ISO 14001 is an internationally accepted standard that sets out the steps to be taken by a business to put in place an effective EMS (EPA, 2002). It helps in integrating the environmental goals into the overall operations of the company. The ISO 14001 standards were written with the consensus of nearly 50 countries and more than 100 countries have endorsed it as an international standard. ISO 14001 is applicable to all types of organisations with varying nature and size of operations. It is also relevant to companies with different risk profiles and is easily adaptable either to an entire organisation or a specific function (Woodside & Aurrichio, 2000). ISO 14001 has become administrative tool towards corporate environmental management (Puvasvaran, 2010). The International Standards organisation (ISO) first published ISO 14001 in 1996. Since then, organisations worldwide have implanted the standard in their operations. There could be various reasons for a company to implement ISO 14001. It helps in promoting a green corporate image and also boosts market share. ISO 14001 helps in a) minimizing waste and thus reduces the costs involved in managing waste, b) reducing insurance and prosecution risks and c) gaining investor confidence and bringing in more ethical investment (Whitelaw, 2004).

2.2.2 Need for ISO 14001 standards and its intended benefits

ISO 14001 is a series of standards used in environmental audits. It outlines an approach focused on processes for efficient environmental management. It can be applied in any organisation irrespective of the size and nature of operations. ISO 14001 mainly involves internal audits and does not include performance goals. Although ISO 14001 has not been

designed specifically for sustainability, it can monitor a number of environment issues and offer a potential platform for sustainability assessment. Few organisations hire consultants to perform the sustainability audits. These consultants offer sustainability audits as a service and conduct an inspection of the carbon footprint of the organisation. They ensure that sustainability policies, procedures and programs are properly implemented throughout the company (Collin & Collin, 2009).

Companies that have worked on improving sustainability are at the forefront of environmental regulation. According to Collin & Collin (2009, pg 126), "The scope of environmentally regulated activities will expand under sustainability to areas of society other than big industry. It will spread to reach smaller industries, and then municipal emissions, military emissions and wastes, and other waste streams that impact the environment. Knowledge of the environmental impacts of development provides much of the impetus toward sustainability."

ISO 14001 provides the framework including the guidelines and standards for an effective and efficient EMS that can be applied to industries irrespective of the nature, size and risk profile (Gbedemah, 2004). These standards provide a platform for internal and external audits. It can used effectively to measure the environmental performance of the company and improve its internal processes for continual improvement. A business can also engage a third party firm that performs audits on the basis of the ISO guidelines and certify its systems and processes (Sedjo, Goetzl & Moffat, 1998).

2.2.3 ISO 14001 sustainability issues

Sustainable business development is one of the primary considerations driving business strategies and operational frameworks. Sustainable development goals involve increased awareness of organisational impact on environment, "acceptance of responsibility of these impacts, expectation that harmful impacts will be reduced or eliminated and the placement of responsibility for environmental impacts upon all members of the community" (Haklik, 2002). The ISO 14001 standards were developed in view of these needs for building a sustainable business environment. ISO 14001 acknowledges that not all environmental aspects affecting an organisation may be in its control. There could be aspects of the environment which the business does not have any influence on. As a result, ISO 14001 requires that a company defines and regulates only those aspects of the environment that it can exert an influence on and control. A business establishing its EMS should look at only those environmental aspects which it can control. The firm's environmental policy should be designed accordingly (Federal Environment Executive, 2004).

ISO 14001 aims at continuous improvement in the environmental performance of a business to bring about a positive impact on the overall environment in which the company functions (Hancock, 2005). The ISO standard consists of five important steps: designing the environmental policy, planning, implementation and operation, checking and corrective action and management review. Once the standard is implemented in the organisation, it creates a self-sustaining cycle that focuses on continuous improvement and helps the company reach its environmental targets (Lesourd & Schilizzi, 2003).

In designing the environmental policy, the company must ensure that it suits the requirements and is relevant to its products and services. The next step is to identify the environmental aspects which it can control and include those aspects in the policy. The company should ensure that its environmental policy conforms to legal requirements. The next step for the business is to establish the environmental goals and objectives. It should lay out the measures through which these goals can be accomplished. The environmental policy should define the roles and responsibilities of each element in the EMS (Cragg, 2005). It is very important to involve employees at all levels in the organisation in implementing ISO 14001 standards.

EMS can succeed and bring about a positive impact on the environment only with the active participation of employees across various functions and levels. The company must also aim at improving the communication between employees and external parties for effective collaboration. It must schedule periodic and regular audits in order to ensure that the performance is sustained and consistent over a period of time. Another crucial aspect is reviewing the EMS by the senior management to ensure that the performance is measured at regular intervals. This helps in checking if the environmental targets are being met. Suggestions for improvement must be considered. In case there are deviations in the performance from the set targets, suitable measures need to be undertaken. This management review helps in bringing about continuous improvement in the EMS (Parto & Copley, 2007).

Strong management support is a critical success factor for the EMS to work effectively in an organisation. ISO 14001 understands this aspect and outlines that it is the responsibility of